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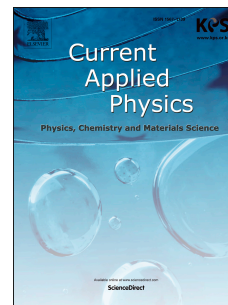
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Short-range magnetic order in $\text{La}_{1-x}\text{Ba}_x\text{CoO}_3$ cobaltitesPhan The Long^{1,2*}, Dimitar N. Petrov³, J. Ćwik⁴, N. T. Dang⁵, Viet Dongquoc⁶¹Theoretical Physics Research Group, Advanced Institute for Materials Science, Ton Duc Thang University, Ho Chi Minh City, Vietnam²Faculty of Applied Sciences, Ton Duc Thang University, Ho Chi Minh City, Vietnam³Department of Physical Chemistry, Plovdiv University “Paisii Hilendarski”, 24 Tzar Asen Str., 4000 Plovdiv, Bulgaria⁴Institute of Low Temperature and Structure Research, PAS, Wroclaw, Poland⁵Institute of Research and Development, Duy Tan University, Da Nang, Vietnam⁶Department of Materials Science and Engineering, Chungnam National University, Daejeon 34134, South Korea**Abstract**

Magnetization versus temperature and magnetic-field measurements, $M(T, H_a)$, have been carried out to study the magnetic and critical properties of polycrystalline $\text{La}_{1-x}\text{Ba}_x\text{CoO}_3$ ($x = 0.3$ and 0.5) cobaltites. These compounds with the density of $\sim 6.2 \text{ g/cm}^3$ crystallized in the $R\bar{3}c$ rhombohedral and $Pm\bar{3}m$ cubic structures, respectively. With an applied field $H_a = 200 \text{ Oe}$, $M(T)$ data have revealed that the samples with $x = 0.3$ and 0.5 exhibit the ferromagnetic-paramagnetic (FM-PM) phase transition at the Curie temperature points $T_C = 202$ and 157 K , respectively. At 4.2 K , the saturation magnetization (M_{sat}) decreases from 35.9 emu/g for $x = 0.3$ to 26.1 emu/g for $x = 0.5$. Particularly, the critical-behavior analyses in the vicinity of T_C reveal all samples undergoing a second-order phase transition, with critical exponent values ($\beta = 0.328$ and $\gamma = 1.251$ for $x = 0.3$, and $\beta = 0.331$ and $\gamma = 1.246$ for $x = 0.5$) close to those expected for the 3D Ising model. This proves short-range magnetic order existing in $\text{La}_{1-x}\text{Ba}_x\text{CoO}_3$. We believe that magnetic inhomogeneities due to the mixture of hole-rich FM regions (confined in the trivalent-cobalt hole-poor anti-FM matrix) and uniaxial anisotropy prevent long-range order in $\text{La}_{1-x}\text{Ba}_x\text{CoO}_3$.

Keywords: Perovskite cobaltites; magnetic properties; critical behavior; second-order phase transition; short-range order

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